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Genetic Parameters of Mastitis-Correlated Milk Components in First Parity Dairy Cows

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Context

Effects of mastitis:

- **lower production**
- **discarded milk**
- **culling**
- **lower milk payment**
- **chronic infection**
- **…**

→ **economical impact is important**

Context

Walloon Region of Belgium:

- **no mastitis data collection**
- **genetic evaluation : SCS modelling**

  weighted by a mastitis infection likelihood (Gengler and Mayeres, Interbull 2003)

    heritabilities : 0.10 – 0.16

Context

Nordic countries:

multi trait model : SCS + mastitis data
+ udder conformation traits

h^2 SCS: 0.11 – 0.14
h^2 mastitis: 0.02 – 0.03
h^2 udder conformation: 0.24 – 0.36

→ **improves EBV accuracy through genetic correlations**

Context

Mid-InfraRed spectrometry (MIR)

= analysis method for milk recording samples

- **classical components**

  fat, protein, lactose, and urea contents

- **new components (e.g. Soyeurt et al.)**

  e.g. fatty acids, minerals, lactoferrin

Objective

Estimate heritabilities and genetic correlations between mastitis-correlated milk components

Choice of milk components

No mastitis data

→ **SCS = best indicator of udder health**

→ **raw correlations between SCS and available milk components**

- **lactations 1 to 10**
- **dim 5 to 365**
- **680,723 test-day data related to spectral data**

Choice of milk components

Highest raw correlations with SCS:

	SCS
Ind. lactoferrin content	0.44
Lactose content	-0.44
Ind. Na content	0.41
Milk yield	-0.24
Protein content	0.23

« Ind. » = indicator of

Calibration of these components have a lower precision, but predictions give a good estimation of component content (RPD = 2.07 for Na and 1.98 for lactoferrin)

Choice of milk components

Highest raw correlations with SCS:

	SCS
Ind. lactoferrin content	0.44
Lactose content	-0.44
Ind. Na content	0.41
Milk yield	-0.24
Protein content	0.23

Milk yield and protein content are well known

→ **heritabilities and genetic correlations for SCS, ind. lactoferrin, lactose, and ind. Na**

(Co)variance components estimation

Data :

- **Only first parity**
- **Dim 5 to 365**
- **Test-day data with all information :**
  SCS, ind. lactoferrin, lactose, and ind. Na
- **Herds with > 10 test-days**
  with spectral information

(Co)variance components estimation

Data :

→ **138,363 test-day records**
40,556 cows and lactations
730 herds

Pedigree :

- **limited to 1970**

→ **170,731 animals**

(Co)variance components estimation

Model :

$$y = X\beta + Zp + Za + e$$

y = observations :

SCS - ind. lactoferrin content - lactose content - ind. Na content

β = fixed effects

- class of breed x class of age at calving x class of 5 DIM
- herd x test-date

p = permanent environment random regression

a = additive genetic random regression

(Co)variance components estimation

Method :

Gibbs sampling

100,000 rounds

burn-in = 10,000

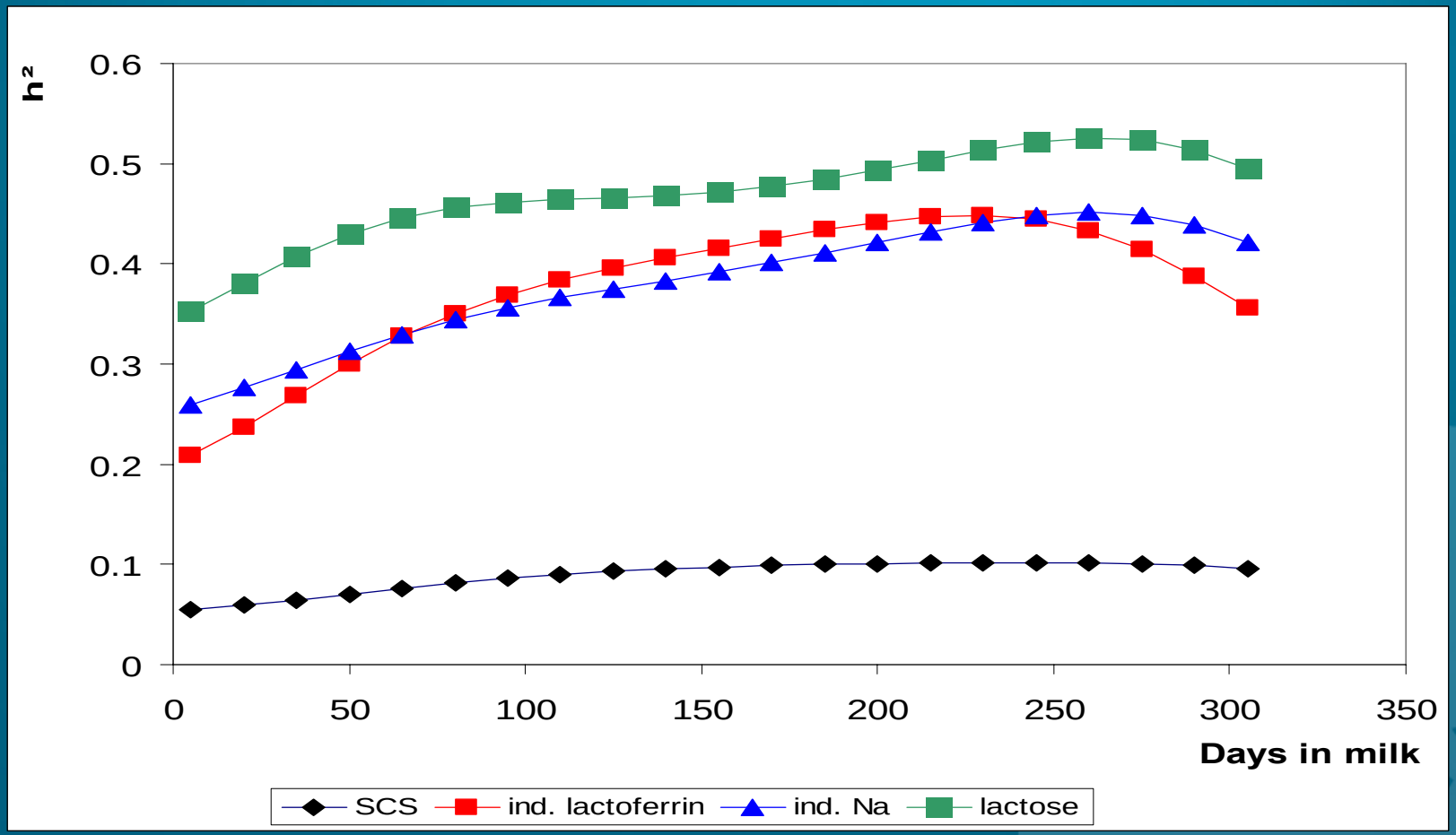
(Co)variance components estimation

Results : Mean daily heritabilities (diagonal), and mean daily genetic correlations

Traits	SCS	Ind. lactoferrin content	Lactose content	Ind. Na content
SCS	0.09			
Ind. lactoferrin content	0.17	0.36		
Lactose content	-0.30	-0.30	0.46	
Ind. Na content	0.30	0.10	-0.71	0.38

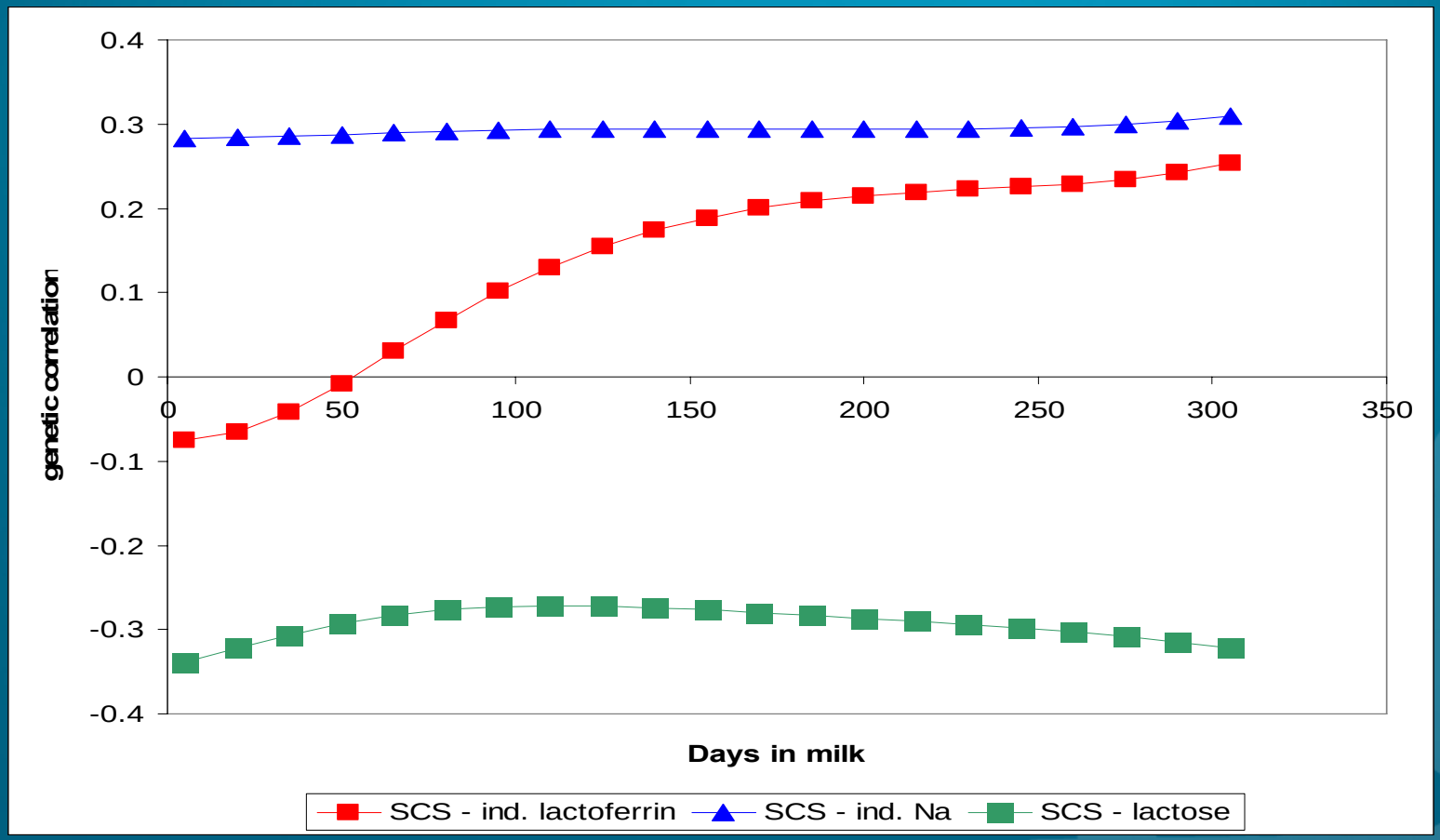
(Co)variance components estimation

Results : Daily heritabilities



(Co)variance components estimation

Results : Daily genetic correlations



Conclusions

- **Mid-Infrared Spectrometry (MIR) can bring new traits**
  - **with heritabilities higher than SCS heritability**
  - **with genetic correlations with SCS**

→ **use of multi-trait test-day models is interresting**

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Thank you for your attention!

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